



# Australian Bureau of Statistics

## **1352.0.55.116 - Research Paper: Appropriate Use of Box-Cox Transforms for Seasonal Adjustment (Methodology Advisory Committee), Jun 2011**

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## Summary

### About this Release

It is well established that appropriate Box–Cox transformation of data is in some cases desirable when using standard analytical techniques. For example, the use of such transforms for variance stabilization in regression and ARIMA time series modelling were developed in Box and Cox (1964) and Box and Jenkins (1970) respectively.

In the setting of seasonal adjustment of time series such transforms offer a compromise between, and extension beyond, the standard additive and multiplicative options of decomposition models. In particular, an appropriate transformation may lead to more stable seasonal factor estimates and in turn reduce current end revisions to seasonally adjusted estimates obtained using the ABS X11-based concurrent method.

The empirical study presented here evaluates two existing methods of selecting the Box–Cox parameter, and proposes two new methods for the purposes of seasonal adjustment. These methods of transformation selection are compared to an optimal transform found by a simple search method. Quality is assessed via measures relating to the volatility of, and current end revisions to, the resulting seasonally adjusted and trend series.

The existing methods evaluated are a maximum likelihood approach, given a seasonal ARIMA model (Hipel et al., 1977), and a time series variance stabilisation method (Guerrero, 1993). A simple alternative is trialled that uses appropriate seasonal dummy variables in a regression ARIMA model. The aim of this latter approach is to apply a transform that results in stable additive seasonal factors. An additional method optimises the Box-Cox parameter with respect to a quality indicator developed by Statistics Canada, known as the M7 value, which provides a measure of the reliability of the seasonal adjustment.

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